

REMARKS

I. Formal Matters

Claims 1-4 and 6-8 are pending in the current application.

Applicant thanks Examiner for approving the substitute drawings filed on April 3, 2002.

Applicant has amended claims 1 and 2 to more clearly recite the features of Applicant's invention that were implicit in the original claims.

The Examiner has maintained the rejection of claims 1-4 and 6-8 from the previous Office Action. The Examiner rejects claims 1-4 and 6-8 under 35 U.S.C § 103(a) as being unpatentable over Applicant's Admitted Prior Art (hereinafter AAPA) in view of U. S. Patent 5,929,847 to Yanagi et al.

II. Prior Art Rejection

Applicant respectfully traverses this rejection. Applicant's invention as claimed in claim 1 is a unique and unobvious circuit for driving a display device for displaying a plurality of gray shades. Neither the AAPA nor Yanagi, either separately or in combination, disclose, teach, or suggest the driving circuit as claimed in claim 1.

For example, the Examiner alleges that it would have been obvious to a person of ordinary skill in the art to utilize the functionality of the op amp circuit taught by Yanagi in conjunction with AAPA. Applicant respectfully disagrees.

Applicant's invention relates to reducing the number of devices required on a chip used to drive LCD display devices by reducing the number of ROM decoders to a fraction of the number

AMENDMENT UNDER 37 C.F.R. § 1.116

U.S. Application No: 09/505,192

Attorney Docket No. Q57919

of shades of gray. The AAPA discusses a conventional driving circuit in which voltages are generated by dividing 9 voltages to output one voltage, and in which the number of ROM decoders is equal to the number of shades of gray.

Yanagi does not address the issue of reducing the number of ROM decoders, nor does it relate to reducing the size of the chips used to drive LCD devices. Yanagi relates to the power consumption of LCD driving circuits, and more specifically to the power supplies used to supply the voltages. Yanagi attempts to reduce the power consumption by reducing the number of these power supplies.

In fact, the proposed combination of Yanagi and AAPA teaches away from reducing the number of ROM decoders by teaching instead to change the number of power supplies which supply the gray shade voltages. Since both the AAPA and Yanagi select from these voltages using the conventional method described in the AAPA, combining these two references could not achieve Applicant's invention as claimed.

For example, one of the features of Applicant's invention as claimed in claim 1 is "gray shade voltage selecting means for selecting one voltage out of a plurality of voltages...based on high order bits composed of at least one bit counted from the most significant bit of said digital image data". Neither the AAPA nor Yanagi teach or suggest at least this feature.

The AAPA discloses that "one gray shade voltage is selected out of the gray shade voltages of 64 values based on the digital image data" (Applicant's specification, page 3, lines 10-12). However, the AAPA does not disclose selecting this gray shade voltage "based on high order bits...of said digital image data" as required by claim 1. The AAPA discloses only

AMENDMENT UNDER 37 C.F.R. § 1.116

U.S. Application No: 09/505,192

Attorney Docket No. Q57919

selecting one of the 64 voltages based on "the digital image data", but discloses nothing about selecting the voltage based on high order bits.

Yanagi does not supply this deficiency in the AAPA. Yanagi does not teach or suggest any means for selecting voltages based on the bits of the digital image data. Yanagi only discloses selecting an output voltage from one of two D.C. power supplies, however, these power supplies contain no bits and are entirely unrelated to the digital image data.

Therefore, neither the AAPA nor Yanagi, either separately or in combination, teach or suggest this feature of claim 1.

Another of the unique features of Applicant's invention as claimed in claim 1 is "voltage adjusting means for inducing a voltage rise or a voltage drop of a voltage outputted from said operational amplifier based on low order bits of said digital image data". Neither the AAPA nor Yanagi teach or suggest at least this feature.

The Examiner acknowledges that the AAPA fails to teach this feature and relies on Yanagi to supply this acknowledged deficiency. Applicant respectfully disagrees with the Examiner's analysis. Claim 1 requires "inducing a voltage rise or a voltage drop...based on low order bits of said digital image data". That is, the voltage rise or drop is induced based on low order bits of digital image data.

In Yanagi, signal POL is not a low order bit of digital image data, as claim 1 requires. Instead, POL is a control signal supplied by a control circuit (Yanagi, column 1, lines 47-49); it is not digital image data. Therefore, POL does not disclose, or suggest, "inducing a voltage rise or a voltage drop...based on said low order bits of said digital image data" as required by claim 1.

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No: 09/505,192
Attorney Docket No. Q57919

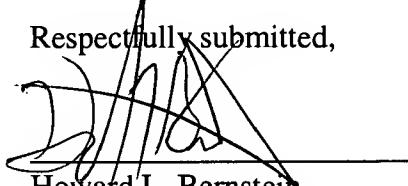
Because neither the AAPA nor Yanagi, considered separately or in combination, teach or suggest at least these features, Applicant's invention as claimed in claim 1 would not have been obvious from AAPA and Yanagi. Therefore, claim 1 is allowable, and claims 2-4 and 6-8 are allowable at least by virtue of their dependence on claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A driving circuit of a display device for displaying a plurality of gray shades based on inputted digital image data comprising:

gray shade voltage generating means for generating a plurality of voltages;

gray shade voltage selecting means for selecting one voltage out of a plurality of voltages supplied from said gray shade voltage generating means based on high order bits composed of at least one bit counted from the most significant bit of said digital image data ~~and the number of bits of which is smaller than that of said digital image data,~~ and for outputting said voltage;

an operational amplifier used to amplify a voltage outputted from said gray shade voltage selecting means; and

voltage adjusting means for inducing a voltage rise or a voltage drop of a voltage outputted from said operational amplifier based on low order bits of said digital image data ~~excluding said high order bits.~~
2. (Amended) The driving circuit of the display device according to claim 1, wherein said voltage adjusting means is comprised of a resistor, one end of which is connected to an output terminal of said operational amplifier, an active device connected to another end of said resistor and controlling means for controlling operations of said active device based on said low

AMENDMENT UNDER 37 C.F.R. § 1.116

U.S. Application No: 09/505,192

Attorney Docket No. Q57919

order bits of said digital image, wherein said other end of said resistor is connected to said display device.